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EXAMINER	
KILDAY, LISA A	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/602,225	Applicant(s) MORAD ET AL.	
	Examiner Lisa Kilday	Art Unit 2829	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *election on 7/2/4*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 7-22 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 7-22 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Election/Restrictions

Applicant's election with traverse of species A4B1C1 in the reply filed on 7/2/04 is acknowledged. The traversal is on the ground(s) that none of the pending claims are directed to mutually exclusive species. This is not found persuasive because a restriction is proper when one of two or more claimed inventions can support separate patents. See MPEP 806.04(f).

Each patent can only be for one invention. See MPEP 806.04(h). The species restriction is based on the specification. Species restrictions give weight to the claims and drawings, which are part of the specification. Species restrictions do not have to follow the claims; it is preferred that species restrictions look at the entire specification. A species restriction is done to prevent future prosecution that includes claims previously presented in past applications, e.g. prevent double patenting. See MPEP 804. A species restriction is done to narrow each application to a single invention. An applicant is not precluded from presenting claims in an RCE or CIP that are drawn to non-elected inventions. But, an applicant cannot present claims that were already prosecuted. This concept is called election by original presentation. Upon allowance of an independent claim, some species may be rejoined with the original elected claims.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 7-10, 14-16, 18-19 are rejected under 35 U.S.C. 102(b) as being anticipated by Maxwell et al. (5,996,353). In re claim 7, Maxwell et al. discloses a method of manufacturing a semiconductor circuit on a substrate in figure 8, comprising the steps of:

providing first (ref. 202 & 220) and second substrate handling robots (203 & 221);

coupling (221 & 208) a first process chamber (204) to the first robot (202 & 220) so that the first robot can transfer a substrate into and out of the first process chamber, wherein the first process chamber is a deposition chamber or a plasma chamber (col. 7, lines 55-62), and wherein the first process chamber is not coupled to the second robot (see fig. 8 where first process chamber 204 is not coupled to second robot 203);

coupling a second process chamber (234) to the second robot (203 & 221) so that the second robot can transfer a substrate into and out of the second process chamber, wherein the second process chamber is a deposition chamber or a plasma chamber (col. 8, lines 21-27), and wherein the second process chamber is not coupled to the first robot;

coupling one or more pass-through chambers (221 & 208) to both the first robot and the second robot so that both the first robot and the second robot can transfer a substrate into and out of each of the pass-through chambers, wherein said one or more pass-through chambers include a first pass-through chamber (col. 8, line 67 – col. 9, line 10); and subsequently performing the sequential steps of:

the first robot (202 & 220) transferring a first substrate into the first pass-through chamber (221 & 208);

heating said first substrate within the first pass-through chamber (col. 9, lines 15-20); and

the second robot (203 & 221) removing said first substrate from the first pass-through chamber (col. 9, lines 7-10; col. 8, line 67 – col. 9, line 4).

In re claim 8, Maxwell et al. discloses the subsequent step of: the second robot (203 & 221) transferring said first substrate to the second process chamber (234); (col. 8, line 27 – col. 9, line 4).

In re claim 9, Maxwell et al. discloses further comprising the subsequent sequential steps of: the second robot (203 & 221) removing said first substrate from the second process chamber (234); (col. 8, line 27 – col. 9, line 4); the second robot transferring said first substrate into one of the pass-through chambers (col. 8, line 67 – col. 9, line 10); the first robot (202 & 220) removing said first substrate from said one pass through chamber (col. 8, line 27 – col. 9, line 4); and the first robot transferring said first substrate to the first process chamber (col. 7, lines 47-62).

In re claim 10, Maxwell et al. discloses wherein said one pass-through chamber (221 & 208) is the first pass-through chamber (col. 8, line 67 – col. 9, line 1).

In re claim 14, Maxwell et al. discloses further comprising the steps of: coupling a loadlock chamber (220) to one of said first (202) and second robots (203) so that said one robot can transfer a substrate into and out of the loadlock chamber, wherein the loadlock chamber (220) is not coupled to the other one of said first and second robots

(see fig. 8, where ref. 220 is not coupled to robot 1-ref. 202); and before the step of the first robot transferring said first substrate into the first pass through chamber, said one robot removing said first substrate from the loadlock chamber (col. 8, line 67 – col. 9, line 10).

In re claim 15, Maxwell et al. discloses further comprising the steps of: coupling a loadlock chamber (220) to one of said first (202) and second robots (203) so that said one robot can transfer a substrate into and out of the loadlock chamber, wherein the loadlock chamber (220) is not coupled to the other one of said first and second robots (see fig. 8, where ref. 220 is not coupled to robot 1-ref. 202); and after the step of the second robot (203) removing said first substrate from the first pass-through chamber, the first robot removing said first substrate from the loadlock chamber (col. 8, lines 5-19).

In re claim 16, Maxwell et al. discloses coupling a loadlock chamber (220) to the first robot (202) so that the first robot (202) can transfer a substrate into and out of the loadlock chamber, wherein the loadlock chamber (220) is not coupled to the second robot (203); and before the step of the first robot (202) transferring said first substrate into the first pass-through chamber, the first robot removing said first substrate from the loadlock chamber (col. 8, line 63-col. 9, line 10).

In re claim 18, Maxwell et al. discloses providing a resistive heater with the pass-through chamber (col. 7, lines 59-60); wherein the heating step comprises the step of said resistive heater heating said first substrate within the pass-through chamber (col. 9, lines 14-20).

In re claim 19, Maxwell et al. discloses directing infrared radiation to heat the first substrate wherein rapid thermal processing includes infrared heating (col. 7, lines 59-60).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 11, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maxwell et al. in view of Loan et al. (6,136,725).

In re claim 11, Maxwell et al. discloses a method of manufacturing a semiconductor circuit on a substrate including that process chambers may be any type of process chamber, such as a rapid thermal processing chamber, a physical vapor deposition chamber (PVD), a chemical vapor deposition chamber (CVD), an etch chamber, etc. (col. 7, lines 55-63). However, Maxwell et al. does not teach the deposition of tantalum or tantalum nitride on the substrate followed by depositing copper on the substrate. However, Loan et al. teaches the deposition of tantalum nitride and copper (col. 2, lines 33-41). Therefore, it would have been obvious to one skilled in the art at the time of invention to modify the process of Maxwell by depositing tantalum nitride followed by copper on the substrate because tantalum nitride and copper are one of the traditional CVD materials deposited using the process of Maxwell.

In re claim 20, Maxwell et al. discloses providing a first and second substrate handling robots (202, 203); coupling a first process chamber to the first robot (202) so that the first robot (202) can transfer a substrate into and out of the first process chamber (col. 8, line 67 – col. 9, line 10), wherein the first process chamber is a deposition chamber or a plasma chamber (col. 7, lines 56-63), and wherein the first process chamber is not coupled to the second robot (see fig. 8 where first process chamber 204 is not coupled to second robot 203); coupling a second process chamber (232) to the second robot (203) so that the second robot can transfer a substrate into and out of the second process chamber, wherein the second process chamber is a deposition or a plasma chamber (col. 7, lines 56-63), and wherein the second process chamber is not coupled to the first robot (see fig. 8 where second process chamber 232 is only coupled to second robot 203);

coupling one or more pass-through chambers (221 & 208) to both the first robot and the second robot so that both the first robot and the second robot can transfer a substrate into and out of each of the pass-through chambers, wherein said one or more pass-through chambers include a first pass-through chamber (col. 8, line 67 – col. 9, line 10); and subsequently performing the sequential steps of:

the first robot (202 & 220) transferring a first substrate into the first pass-through chamber (221 & 208);

heating said first substrate within the first pass-through chamber (col. 9, lines 15-20); and

the second robot (203 & 221) removing said first substrate from the first pass-through chamber (col. 9, lines 7-10; col. 8, line 67 – col. 9, line 4);

the second robot (203 & 221) transferring said first substrate to the second process chamber (234); (col. 8, line 27 – col. 9, line 4);

the first robot (202 & 220) removing said first substrate from said one pass through chamber (col. 8, line 27 – col. 9, line 4); and the first robot transferring said first substrate to the first process chamber (col. 7, lines 47-62).

However, Maxwell et al. does not teach or suggest depositing tantalum or tantalum nitride on the substrate and depositing copper on the substrate. However, Loan et al. teaches the deposition of tantalum nitride and copper (col. 2, lines 33-41). Therefore, it would have been obvious to one skilled in the art at the time of invention to modify the process of Maxwell by depositing tantalum nitride followed by copper on the substrate because tantalum nitride and copper are one of the traditional CVD materials deposited using the process of Maxwell.

Claims 12-13, 17, 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maxwell et al. and Loan et al. as applied to claim 11 above, and further in view of Chopra (6,413,858). In re claim 12, Maxwell et al. discloses a method of manufacturing a semiconductor circuit on a substrate including that process chambers may be any type of process chamber, such as a rapid thermal processing chamber, a physical vapor deposition chamber (PVD), a chemical vapor deposition chamber (CVD), an etch chamber, etc. (col. 7, lines 55-63). However, Maxwell et al. does not teach the deposition of copper on the substrate. However, Loan et al. teaches

the deposition of tantalum nitride and copper (col. 2, lines 33-41). Therefore, it would have been obvious to one skilled in the art at the time of invention to modify the process of Maxwell by depositing tantalum nitride followed by copper on the substrate because tantalum nitride and copper are one of the traditional CVD materials deposited using the process of Maxwell.

However, Maxwell et al. and Loan et al. do not teach the step of removing native oxide from the surface of the substrate. However, Chopra ('858) teaches removing native oxide prior to the deposition of copper on the substrate (abstract; col. 8, lines 10-35). Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify the process of both Maxwell and Loan et al. by removing the native oxide in order to preclean the substrate and prepare a surface free of contamination prior to copper deposition.

In re claim 13, Maxwell et al. teaches coupling a third process chamber (236) to the second robot. A third process chamber that is coupled to the second robot is held to be an obvious matter of duplication of parts. The courts have held that mere duplication of parts has no patentable significance unless a new or unexpected result is produced (see *In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960)). It would be obvious to one with ordinary skill in the art to have a third process chamber to the second robot because it would increase the efficiency of wafer throughput and the flexibility of wafer processing sequence by allowing independent access of the robots to the wafers being processed to the different sets of processing tools.

In re claim 17, Maxwell et al. teaches coupling a loadlock chamber (220) to the first robot (202) so that the first robot (202) can transfer a substrate into and out of the loadlock chamber, wherein the loadlock chamber (220) is not coupled to the second robot (203). However, Maxwell et al. does not teach the subsequent steps of the second robots transferring said first substrate into one of the pass-through chambers; the first robot removing said first substrate from said one pass-through chamber; and the first robot transferring said first substrate into the loadlock chamber. As noted above, the function of the robots is an obvious matter of duplication of parts. That the first and second robots can each access at least two loadlocks is obvious over the orientation of the first and second robots and loadlock chamber in the teachings of Maxwell et al.

In re claim 21, Maxwell et al. discloses providing a first and second substrate handling robots (202, 203); coupling a first process chamber to the first robot (202) so that the first robot (202) can transfer a substrate into and out of the first process chamber (col. 8, line 67 – col. 9, line 10), wherein the first process chamber is a deposition chamber or a plasma chamber (col. 7, lines 56-63), and wherein the first process chamber is not coupled to the second robot (see fig. 8 where first process chamber 204 is not coupled to second robot 203); coupling a second process chamber (232) to the second robot (203) so that the second robot can transfer a substrate into and out of the second process chamber, wherein the second process chamber is a deposition or a plasma chamber (col. 7, lines 56-63), and wherein the second process chamber is not coupled to the first robot (see fig. 8 where second process chamber 232 is only coupled to second robot 203);

coupling one or more pass-through chambers (221 & 208) to both the first robot and the second robot so that both the first robot and the second robot can transfer a substrate into and out of each of the pass-through chambers, wherein said one or more pass-through chambers include a first pass-through chamber (col. 8, line 67 – col. 9, line 10); and subsequently performing the sequential steps of:

the first robot (202 & 220) transferring a first substrate into the first pass-through chamber (221 & 208);

heating said first substrate within the first pass-through chamber (col. 9, lines 15-20); and

the second robot (203 & 221) removing said first substrate from the first pass-through chamber (col. 9, lines 7-10; col. 8, line 67 – col. 9, line 4);

the second robot (203 & 221) transferring said first substrate to the second process chamber (234); (col. 8, line 27 – col. 9, line 4);

the first robot (202 & 220) removing said first substrate from said one pass through chamber (col. 8, line 27 – col. 9, line 4); and the first robot transferring said first substrate to the first process chamber (col. 7, lines 47-62).

However, Maxwell et al. does not teach or suggest copper on the substrate. However, Loan et al. teaches the deposition copper (col. 2, lines 33-41). Therefore, it would have been obvious to one skilled in the art at the time of invention to modify the process of Maxwell by depositing copper on the substrate because copper is one of the traditional CVD materials deposited using the process of Maxwell.

However, Maxwell et al. and Loan et al. do not teach the step of removing native oxide from the surface of the substrate. However, Chopra ('858) teaches removing native oxide prior to the deposition of copper on the substrate (abstract; col. 8, lines 10-35). Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify the process of both Maxwell and Loan et al. by removing the native oxide in order to preclean the substrate and prepare a surface free of contamination prior to copper deposition.

In re claim 22, Maxwell et al. teaches coupling a third process chamber (236) to the second robot. A third process chamber that is coupled to the second robot is held to be an obvious matter of duplication of parts. The courts have held that mere duplication of parts has no patentable significance unless a new or unexpected result is produced (see *In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960)). It would be obvious to one with ordinary skill in the art to have a third process chamber to the second robot because it would increase the efficiency of wafer throughput and the flexibility of wafer processing sequence by allowing independent access of the robots to the wafers being processed to the different sets of processing tools. However, as noted above Maxwell et al. does not teach a step of removing native oxide or depositing tantalum or tantalum nitride on the first substrate. However, Loan et al. teaches the deposition tantalum nitride (col. 2, lines 33-41). Therefore, it would have been obvious to one skilled in the art at the time of invention to modify the process of Maxwell by depositing tantalum nitride on the substrate because tantalum nitride is one of the traditional CVD materials deposited using the process of Maxwell.

However, Maxwell et al. and Loan et al. do not teach the step of removing native oxide from the surface of the substrate. However, Chopra ('858) teaches removing native oxide prior to the deposition of copper on the substrate (abstract; col. 8, lines 10-35). Therefore, it would have been obvious to one skilled in the art at the time of the invention to modify the process of both Maxwell and Loan et al. by removing the native oxide in order to preclean the substrate and prepare a surface free of contamination prior to copper deposition.

Conclusion

Any inquiry of a general nature or relating to the status of this application should be directed to the Group Receptionist whose telephone number is (703) 308-0957. See MPEP 203.08.

Any inquiry concerning this communication from the examiner should be directed to Lisa Kilday whose telephone number is (571) 272-1962. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Tokar, can be reached on (571) 272-1812. The fax number for the group is (703) 872-9306. MPEP 502.01 contains instructions regarding procedures used in submitting responses by facsimile transmission.

Lisa Kilday

LAK LAK

8/21/04

Lisa Kilday
Patent Examiner
AU 2829